

Stanford Telecom / New Mexico State University

ACTS Propagation Measurements Program

Five Year Data Analysis Summary

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Agenda

- ❑ **Introduction**
 - Experiment configuration

- ❑ **NM ACTS K_A band measurements and analysis**
 - Seasonal statistics
 - Annual model comparisons
 - Five years (12/93-8/98) of propagation statistics

- ❑ **Future activities**

New Mexico APT

Measured parameters

- Beacons: 20.185 GHz and 27.505 GHz
- Radiometers: 20 GHz and 27.505 GHz
- Rain rate (CRG, TBG)
- Temperature, Relative Humidity, Wind Vector, Barometric Pressure

Rain Region:

- Crane Region: F
- ITU Region: E

Site Specific Geometrical Parameters:

- Elevation Angle: 51°
- Polarization Tilt: 79°
- Altitude: 1.459 km
- Latitude: 32° 32' 40" N & Longitude: 106° 36' 48" W

Seasonal AFS Statistics

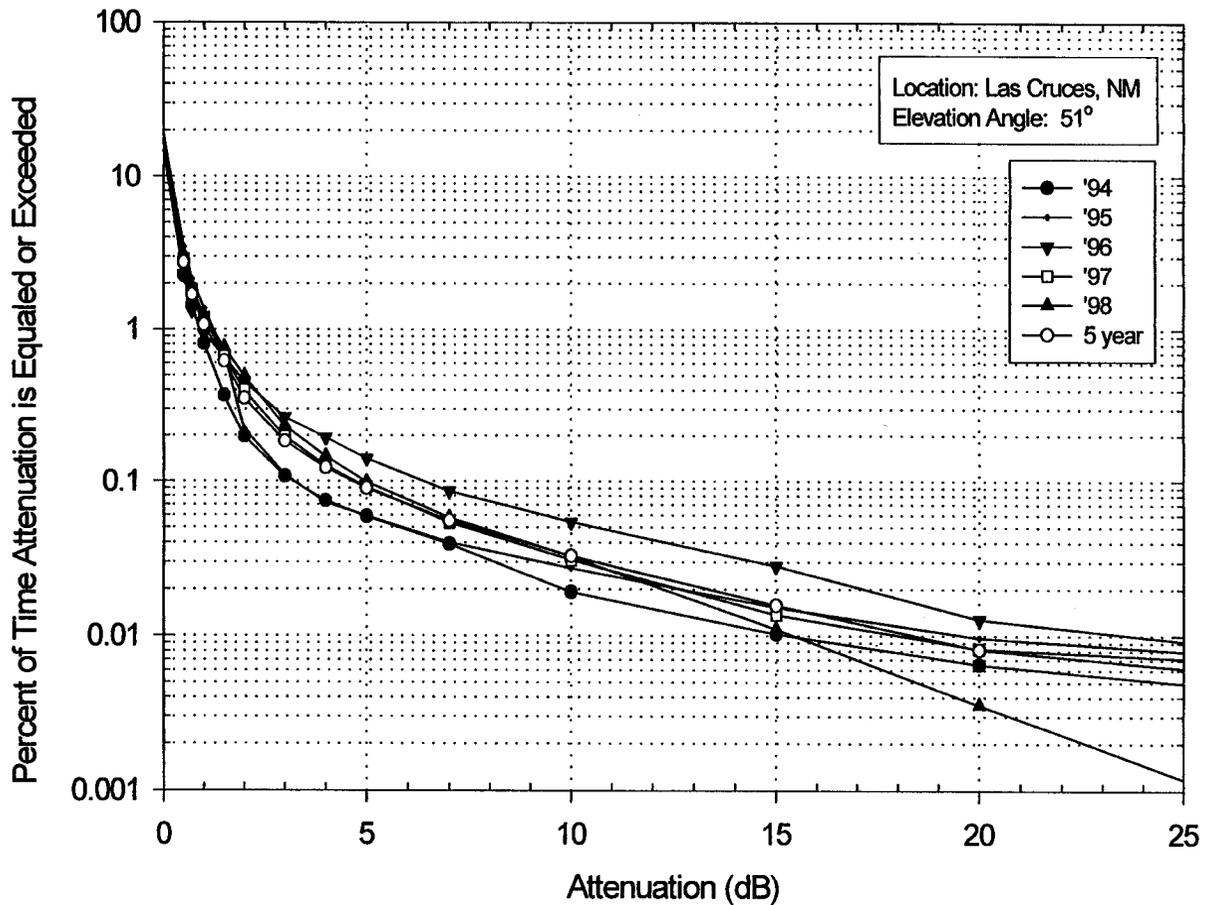
20.2 GHz

% Availability % Outage Time	Winter		Spring		Summer		Fall	
	99.9 0.1	99.99 0.01	99.9 0.1	99.99 0.01	99.9 0.1	99.99 0.01	99.9 0.1	99.99 0.01
1994	2.1 dB	2.7 dB	2.2 dB	7.0 dB	7.5 dB	22.8 dB	3.5 dB	10.6 dB
1995	2.8 dB	3.5 dB	1.3 dB	3.6 dB	9.0 dB	>25.0 dB	2.8 dB	6.8 dB
1996	5.5 dB	6.0 dB	1.4 dB	1.6 dB	13.1 dB	>25.0 dB	5.5 dB	16.5 dB
1997	2.8 dB	3.9 dB	4.2 dB	14.0 dB	10.5 dB	>25.0 dB	3.8 dB	7.6 dB
1998	2.2 dB	4.0 dB	2.5 dB	3.2 dB	10.0 dB	21.0 dB	6.2 dB	16.2 dB
5 year	3.0 dB	5.5 dB	2.4 dB	8.0 dB	10.0 dB	>25.0 dB	4.5 dB	13.0 dB

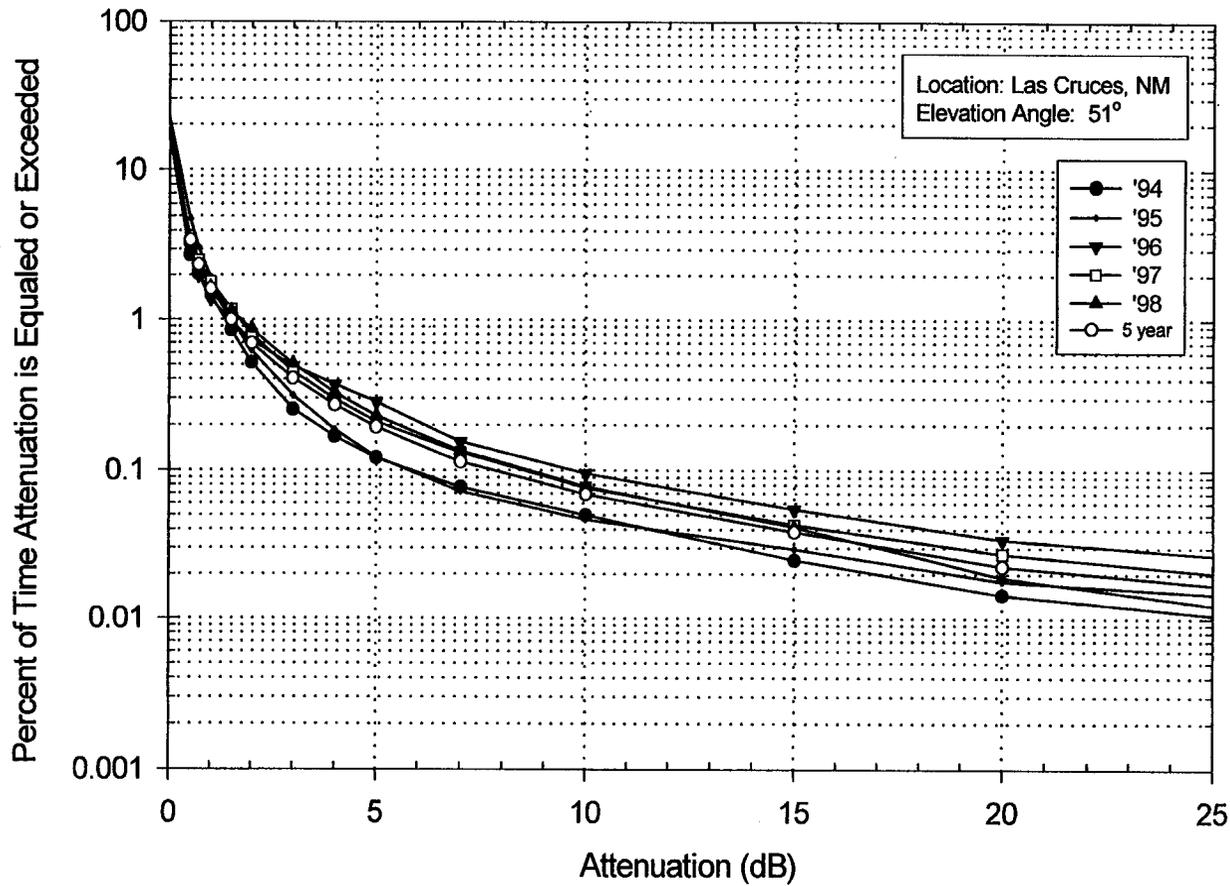
27.5 GHz

% Availability % Outage Time	Winter		Spring		Summer		Fall	
	99.9 0.1	99.99 0.01	99.9 0.1	99.99 0.01	99.9 0.1	99.99 0.01	99.9 0.1	99.99 0.01
1994	3.0 dB	4.2 dB	3.3 dB	10.8 dB	13.5 dB	>25.0 dB	6.0 dB	17.0 dB
1995	4.6 dB	6.2 dB	2.2 dB	5.2 dB	15.0 dB	>25.0 dB	4.6 dB	12.2 dB
1996	7.0 dB	7.5 dB	1.7 dB	2.5 dB	22.0 dB	>25.0 dB	9.2 dB	>25.0 dB
1997	4.3 dB	6.0 dB	7.0 dB	23.0 dB	13.8 dB	>25.0 dB	6.2 dB	13.0 dB
1998	3.5 dB	6.0 dB	3.2 dB	4.4 dB	16.8 dB	>25.0 dB	11.0 dB	>25.0 dB
5 year	4.5 dB	7.3 dB	3.2 dB	13.6 dB	17.0 dB	>25.0 dB	7.5 dB	16.0 dB

Annual 20 GHz ACA Using Empirical Distribution Files



Annual 27 GHz ACA Using Empirical Distribution Files

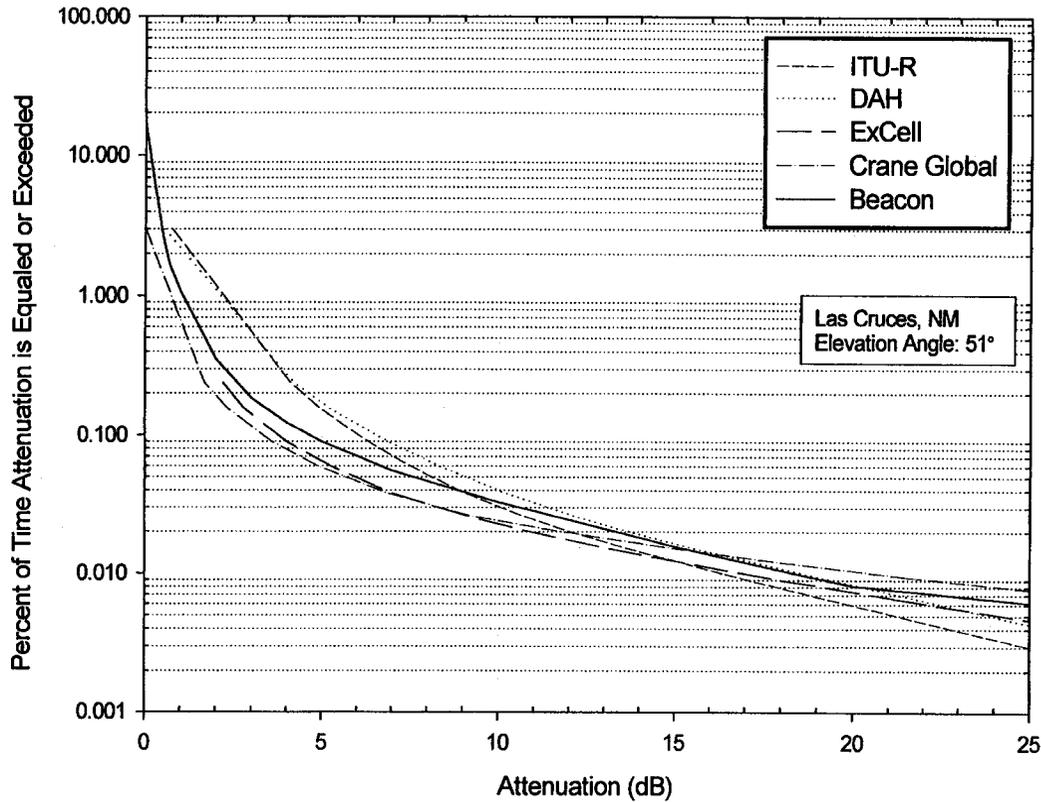


Annual AFS Fade Margins For New Mexico APT

% Availability % Outage Time	20.2 GHz		27.5 GHz	
	99.9 0.1	99.99 0.01	99.9 0.1	99.99 0.01
1994	5.5 dB	17.0 dB	8.4 dB	25.0 dB
1995	3.5 dB	19.0 dB	6.0 dB	>25.0 dB
1996	6.5 dB	18.0 dB	10.0 dB	>25.0 dB
1997	5.5 dB	18.5 dB	9.0 dB	>25.0 dB
1998	5.0 dB	15.8 dB	8.5 dB	>25.0 dB
5 year	5.0 dB	18.5 dB	7.5 dB	>25.0 dB

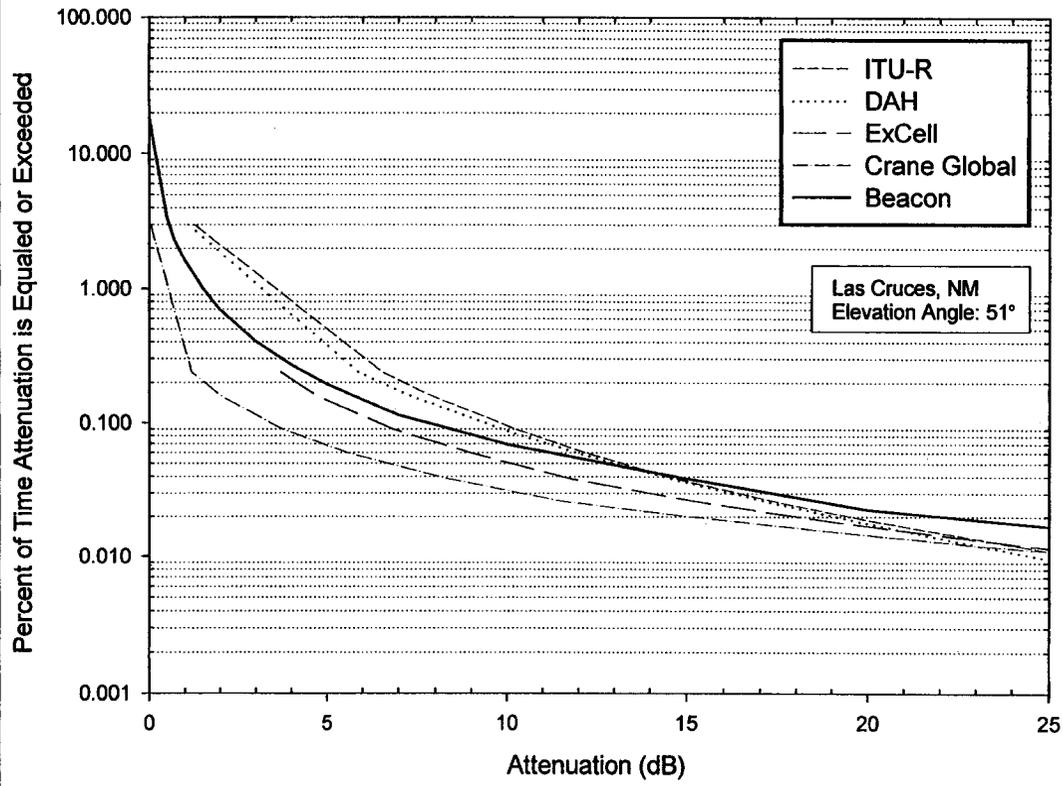
- Wet Surface Effects NOT removed from the data.

Comparison of Rain Attenuation Models (20.2GHz)



- Cumulative 5 year ACA
- Wet Surface Effects Added to the models (Ref. Crane)

Comparison of Rain Attenuation Models (27.5 GHz)



- Cumulative 5 year ACA
- Wet Surface Effects Added to the models (Ref. Crane)